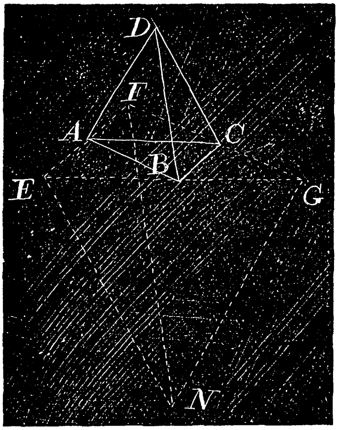
SOLUTION BY NEWTON FITZ, NORFOLK, VIRGINIA.



Le ABC-D represent the tetrahedron V, and let a be its altitude.

A plane through A parallel to the plane DBC will cut the plane of the base in EF parallel to BC. A plane througn B parallel to DAC will cut the plane of the base in EG parallel to AC; and a plane through C parallel to DAB will cut the plane of the base in FG parallel to AB. The intersections of these three planes will be the lines EN, FN, GN, parallel respectively to DC, DB and DA.

The tetrahedron EFG-N will be similar to V and to V'. Because $AC = EB = BG$ the altitude of EFG-$N = 2a$. The altitude of the frustrum remaining to V' after EFG-N is removed is equal to the altitude of V, $= a$. Hence the altitude of $V' = 3a$ and $V' = 27V$. Q. E. D.

[Prof. Hyde's solution of this problem and also his solution of 225 are by quaternions. It was our intention to insert one of these solutions but the space remaining will not permit; and for like reason a solution of Mr. Baker's question, on p. 143, by Mr. Eastwood, and of Mr. Heal's question, on the same page, by Mr. Adcock, are, at present, excluded.]

PROBLEMMS.

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231. BY PROF. ORSON PRATT, SEN. — What is the sum expressed in terms of m, of the values of all the determinants, from the second to the nth orders inclusive, which can be formed from the m-gonal series of numbers, represented by $1, a_2, a_3, a_4, \ldots a_n$, the arrangement of the constituants of the respective determinants being after the following form:

$$\begin{vmatrix} 1, & a_2 \\ a_3, & a_4 \end{vmatrix} + \begin{vmatrix} 1, & a_2, & a_3 \\ a_4, & a_5, & a_6 \\ a_7, & a_8, & a_9 \end{vmatrix} + \begin{vmatrix} 1, & a_2, & a_3, & a_4, \\ a_5, & a_6, & a_7, & a_8, \\ a_9, & a_{10}, & a_{11}, & a_{12}, \\ a_{13}, & a_{14}, & a_{15}, & a_{16}, \end{vmatrix} + \&c.?$$

232. BY PROF. J. H. KERSHNER.—From two given points on a circle to draw straight lines through a point C in the circumference so they shall form with a line MN, given in position, a triangle CMN of given area.

233. *Selected, by Prof. M. L. Comstock.*—If $ABCD$ be a spherical quadrilateral whose sides AB, DC are produced to meet at P, and AD, BC, to meet at Q, and whose diagonals AC, BD intersect at R, then

$$\sin AB \sin CD \cos P - \sin AD \sin BC \cos Q = \pm \sin AC \sin BD \cos R.$$

234. *By P. Richardson.* — $ABCD$ is a trapezium, $AB = a$, $CD = b$, $AD = c$; angle ABC is a right angle, and E is a point on AD such that angle BCE is a right angle and $CE = CD = b$.

It is required to find BC, DE and AE.

235. *By W. E. Heal.*—Find the condition that the general equation of the nth degree may have q equal roots.

236. *By Christine Ladd, Baltimore Md.*—If A_1A_2, B_1B_2, C_1C_2 are three lines which meet in a point O, then there are four different ways in which the points A_1, B_1, C_1, A_2, B_2, C_2, can be combined into two homologous triangles, and for each combination there is a different axis of homology. Show that these four axes form a complete quadrilateral whose diagonals intersect each other on the lines A_1A_2, B_1B_2, C_1C_2.

237. *By Prof. D. J. Mc Adam.*—Prove that

$$\int_0^\pi \frac{\cos\frac{1}{2}(n-1)(\theta+\pi)\sin\frac{1}{2}[n(\theta+\pi)]}{\sin\frac{1}{2}(\theta+\pi)}d\theta = \pi.$$

238. *By Artemas Martin, M. A.* — Two points are taken at random in the surface of a circle, radius r, one of them being confined to a given radius, and a chord drawn through the points. Find (1) the chance that the length of the chord does not exceed $2a$, and (2) the chance that it does not exceed the radius of the circle.

239. *By Prof. A. B. Evans.*—A can plant thirty-six per cent of his arrows within a circular target ten inches in diameter at the distance of one hundred yards; B can plant sixty-four per cent of his arrows within a circle thirteen and one third inches in diameter at the same distance.

Prove that B's skill is greater than A's.

240. *By Prof. Johnson.* — If the angles θ, φ and ψ are connected by a certain relation any two of them may be the oblique angles of a spherical right triangle, and the third will be the complement of the perpendicular from the right-angle to the hypothenuse. Give a geometrical construction of the three triangles thus connected, and find the relations that exist between their sides.